

APPENDIX A

DETAILED TABLES

APPENDIX A. DETAILED TABLES

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Table A-1. Expenditures for the maintenance/repair of existing academic research instruments, by type of unit and type of expenditure: 1982-83 to 1993

[Dollars in millions]

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Type of unit and type of expenditure	Survey year			
	1982-83	1985-86	1988-89	1993
All units:				
Total, maintenance/repair	--	--	\$289	\$234
Service contracts and field service	--	--	158	--
Other (salaries, tools, etc.)	--	--	131	--
Units with all instruments costing less than \$1,000,000:				
Total, maintenance/repair	\$100	\$140	173	162
Service contracts and field service	40	68	86	--
Other (salaries, tools, etc.)	59	72	87	--
Units with an instrument costing \$1,000,000 or more:				
Total, maintenance/repair	--	--	116	72
Service contracts and field service	--	--	71	--
Other (salaries, tools, etc.)	--	--	44	--

NOTES: This table, which includes data for all four survey cycles, is presented in a three-part format to reflect the changing coverage of instruments in the survey.

In 1982-83 and 1985-86 data were collected only for instruments (and their corresponding units) with an original purchase price of \$10,000-\$999,999.

In 1988-89 and 1993 coverage was expanded to include instruments with an original purchase price of \$1,000,000 or more.

In 1993, the minimum purchase price of an in-scope instrument was changed from \$10,000 to \$20,000.

For consistency, data from the 1982-83, 1985-86, and 1988-89 surveys were standardized using the same minimum purchase price criterion of \$20,000 in constant 1993 dollars, based on the GDP implicit price deflator. The \$1,000,000 criterion was also standardized in constant 1993 dollars.

Because of rounding, details may not add to totals.

KEY: -- = data not collected in that survey year

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

**Table A-2. Reported adequacy of maintenance/repair on research instruments,
by field of science and engineering: 1994**

[Percent]

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Field of science and engineering	Reported adequacy of maintenance/repair					Mean rating
	Excellent		Adequate		Poor	
Total	6%	20%	46%	23%	5%	3.0
Engineering	6	13	49	23	9	3.2
Chemistry	3	9	50	28	11	3.4
Physics/astronomy	5	24	47	21	2	2.9
Environmental sciences	11	13	36	36	4	3.1
Computer science	13	41	27	14	5	2.6
Academic departments	14	32	21	24	9	2.8
Computer facilities	12	52	33	3	1	2.3
Agricultural sciences	*	13	53	28	5	3.2
Biological sciences	5	25	47	19	3	2.9
Other, multidisciplinary	6	25	45	23	2	2.9

NOTES: Reported adequacy of maintenance/repair was rated on a scale from 1 (excellent) to 5 (poor).

Because of rounding, percents may not add to 100.

KEY: * = less than 0.5 percent

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-3. Expenditures for the operation of existing academic research instruments, by type of unit and type of expenditure: 1988-89 and 1993

[Dollars in millions]

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Type of unit and type of expenditure	Survey year	
	1988-89	1993
All units:		
Total, operation ¹	\$726	\$563
Salaries to operate research instruments	538	--
Other operating costs	187	--
Units with all instruments costing less than \$1,000,000:		
Total, operation ¹	415	369
Salaries to operate research instruments	340	--
Other operating costs	76	--
Units with an instrument costing \$1,000,000 or more:		
Total, operation ¹	310	194
Salaries to operate research instruments	199	--
Other operating costs	112	--

¹ Total operation includes salaries for technicians or other personnel paid to operate research instruments, and costs of supplies and materials used in operating the instruments.

NOTES: In 1993, the minimum purchase price of an in-scope instrument was changed from \$10,000 to \$20,000. For consistency, data from the 1988-89 survey were standardized using the same minimum purchase price criterion of \$20,000 in constant 1993 dollars, based on the GDP implicit price deflator. The \$1,000,000 criterion was also standardized in constant 1993 dollars.

Because of rounding, details may not add to totals.

KEY: -- = data not collected in that survey year

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

**Table A-4. Reported availability of resources to operate current instruments,
by field of science and engineering: 1994**

[Percent]

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Field of science and engineering	Reported availability of resources					Mean rating
	Excellent		Adequate		Poor	
Total	2%	9%	47%	34%	8%	3.4
Engineering	1	10	47	30	12	3.4
Chemistry	1	4	45	40	10	3.5
Physics/astronomy	2	5	51	40	2	3.3
Environmental sciences	1	5	42	41	12	3.6
Computer science	2	17	49	27	6	3.2
Academic departments	1	26	32	32	9	3.2
Computer facilities	2	8	67	20	3	3.1
Agricultural sciences	0	5	36	47	12	3.7
Biological sciences	3	9	50	31	6	3.3
Other, multidisciplinary	6	6	31	55	2	3.4

NOTES: Reported availability of resources was rated on a scale from 1 (excellent) to 5 (poor).

Because of rounding, percents may not add to 100.

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

**Table A-5. Expenditures for the purchase of academic research instruments,
by type of unit and source of funds: 1982-83 to 1993**

[Dollars in millions]

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Type of unit and source of funds	Survey year			
	1982-83	1985-86	1988-89	1993
Total, all units	--	--	--	\$1,203
Federal funds	--	--	--	624
Non-Federal funds	--	--	--	580
Institution or unit funds	--	--	--	292
State grant or appropriation ¹	--	--	--	102
Industry	--	--	--	80
Other non-Federal sources ²	--	--	--	105
 Total, units with all instruments costing less than \$1,000,000	 \$397	 \$669	 --	 935
Federal funds	199	329	--	433
Non-Federal funds	198	340	--	502
Institution or unit funds	95	149	--	253
State grant or appropriation ¹	42	90	--	84
Industry	33	58	--	71
Other non-Federal sources ²	28	42	--	94
 Total, units with an instrument costing \$1,000,000 or more	 --	 --	 --	 268
Federal funds	--	--	--	190
Non-Federal funds	--	--	--	77
Institution or unit funds	--	--	--	39
State grant or appropriation ¹	--	--	--	19
Industry	--	--	--	9
Other non-Federal sources ²	--	--	--	11

¹ In survey years 1982-83 and 1985-86 the question was worded "State equipment or capital development appropriations."

² Other non-Federal includes private, nonprofit foundations, gifts/donations, and bonds.

NOTES: This table, which includes data for all four survey cycles, is presented in a three-part format to reflect the changing coverage of instruments in the survey.

In 1982-83 and 1985-86 data were collected only for instruments (and their corresponding units) with an original purchase price of \$10,000-\$999,999.

In 1988-89 and 1993 coverage was expanded to include instruments with an original purchase price of \$1,000,000 or more.

In 1993, the minimum purchase price of an in-scope instrument was changed from \$10,000 to \$20,000.

For consistency, data from the 1982-83, 1985-86, and 1988-89 surveys were standardized using the same minimum purchase price criterion of \$20,000 in constant 1993 dollars, based on the GDP implicit price deflator. The \$1,000,000 criterion was also standardized in constant 1993 dollars.

Because of rounding, details may not add to totals.

KEY: -- = data not collected in that survey year

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-6. Median expenditures for the maintenance/repair of existing academic research instruments, by type of unit and type of expenditures: 1982-83 to 1993

[Dollars in thousands]

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Type of unit and type of expenditure	Survey year			
	1982-83	1985-86	1988-89	1993
All units:				
Total, maintenance/repair	--	--	\$43	\$30
Service contracts and field service	--	--	19	--
Other (salaries, tools, etc.)	--	--	16	--
Units with all instruments costing less than \$1,000,000:				
Total, maintenance/repair	\$22	\$34	38	25
Service contracts and field service	9	14	16	--
Other (salaries, tools, etc.)	8	12	14	--
Units with an instrument costing \$1,000,000 or more:				
Total, maintenance/repair	--	--	210	128
Service contracts and field service	--	--	75	--
Other (salaries, tools, etc.)	--	--	50	--

NOTES: This table, which includes data for all four survey cycles, is presented in a three-part format to reflect the changing coverage of instruments in the survey.

In 1982-83 and 1985-86 data were collected only for instruments (and their corresponding units) with an original purchase price of \$10,000-\$999,999.

In 1988-89 and 1993 coverage was expanded to include instruments with an original purchase price of \$1,000,000 or more.

In 1993, the minimum purchase price of an in-scope instrument was changed from \$10,000 to \$20,000.

For consistency, data from the 1982-83, 1985-86, and 1988-89 surveys were standardized using the same minimum purchase price criterion of \$20,000 in constant 1993 dollars, based on the GDP implicit price deflator. The \$1,000,000 criterion was also standardized in constant 1993 dollars.

Because of rounding, details may not add to totals.

KEY: -- = data not collected in that survey year

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-7. Median expenditures for the operation of existing academic research instruments, by type of unit and type of expenditure: 1988-89 and 1993

[Dollars in thousands]

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Type of unit and type of expenditure	Survey year	
	1988-89	1993
All units:		
Total, operation ¹	\$75	\$47
Salaries to operate research instruments	60	--
Other operating costs	0	--
Units with all instruments costing less than \$1,000,000:		
Total, operation ¹	60	40
Salaries to operate research instruments	50	--
Other operating costs	0	--
Units with an instrument costing \$1,000,000 or more:		
Total, operation ¹	397	200
Salaries to operate research instruments	217	--
Other operating costs	80	--

¹ Total operation includes salaries for technicians or other personnel paid to operate research instruments, and costs of supplies and materials used in operating the instruments.

NOTES: In 1993, the minimum purchase price of an in-scope instrument was changed from \$10,000 to \$20,000. For consistency, data from the 1988-89 survey were standardized using the same minimum purchase price criterion of \$20,000 in constant 1993 dollars, based on the GDP implicit price deflator. The \$1,000,000 criterion was also standardized in constant 1993 dollars.

Because of rounding, details may not add to totals.

KEY: -- = data not collected in that survey year

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-8. Reported change over the past two years in instrument needs, by type of unit and field of science and engineering: 1994

[Percent]

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Type of unit and field of science and engineering	Reported change in instrument needs					Mean rating
	Substantially increased	Increased	Remained about the same	Decreased	Substantially decreased	
Total, all units	24%	45%	30%	2%	*	2.1
Engineering	24	44	30	2	0%	2.1
Chemistry	36	42	21	1	0	1.9
Physics/astronomy	24	38	37	0	0	2.1
Environmental sciences	29	44	20	4	3	2.1
Computer science	29	39	31	1	0	2.0
Academic departments	32	57	11	0	0	1.8
Computer facilities	25	18	55	2	0	2.3
Agricultural sciences	23	40	34	2	1	2.2
Biological sciences	19	48	32	1	0	2.1
Other, multidisciplinary	22	51	23	3	0	2.1
Total, units with all instruments costing less than \$1,000,000	24	45	29	2	*	2.1
Engineering	24	44	30	2	0	2.1
Chemistry	38	41	19	1	0	1.8
Physics/astronomy	27	32	41	0	0	2.1
Environmental sciences	30	45	18	3	3	2.1
Computer science	28	55	17	0	0	1.9
Academic departments	27	60	12	0	0	1.8
Computer facilities	30	31	39	0	0	2.1
Agricultural sciences	23	40	34	2	2	2.2
Biological sciences	19	48	32	1	0	2.1
Other, multidisciplinary	23	51	23	3	0	2.1
Total, units with an instrument costing \$1,000,000 or more	22	34	43	1	0	2.2
Engineering	31	25	44	0	0	2.1
Chemistry	S	S	S	0	0	S
Physics/astronomy	13	64	23	0	0	2.1
Environmental sciences	15	34	47	4	0	2.4
Computer science	30	18	50	2	0	2.2
Academic departments	S	S	0	0	0	S
Computer facilities	23	15	59	2	0	2.4
Agricultural sciences	0	S	0	0	0	S
Biological sciences	0	S	S	0	0	S
Other, multidisciplinary	0	S	S	0	0	S

NOTES: Reported change in instrumentation needs was rated on a scale from 1 (substantially increased) to 5 (substantially decreased).

Reported change in instrumentation needs refers to the period 1992 to 1994.

Because of rounding, percents may not add to 100.

KEY: * = less than 0.5 percent
S = fewer than 10 cases for analysis

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-9. Overall capability of research instruments to enable existing faculty investigators to pursue their major research interests, by field of science and engineering: 1994

[Percent]

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Field of science and engineering	Capability of instruments to enable research					Mean rating
	Excellent		Adequate		Poor	
Total	5%	20%	33%	39%	3%	3.2
Engineering	1	18	32	45	4	3.3
Chemistry	5	22	12	49	12	3.4
Physics/astronomy	7	15	29	48	1	3.2
Environmental sciences	2	22	30	43	3	3.2
Computer science	2	22	38	28	9	3.2
Academic departments	1	27	46	9	17	3.1
Computer facilities	4	16	30	50	1	3.3
Agricultural sciences	2	15	48	34	1	3.2
Biological sciences	8	24	35	32	*	2.9
Other, multidisciplinary	2	9	40	47	1	3.4

NOTES: Overall capability of research instruments was rated on a scale from 1 (excellent) to 5 (poor).

Because of rounding, percents may not add to 100.

KEY: * = less than 0.5 percent

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-10. Median cost to purchase the top priority item requested and percent of respondents requesting that item, by major type of instrument and field of science and engineering: 1994

[Dollars]

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Field of science and engineering	All instruments		Computers and data handling instruments		Chromatographs and spectrometers		Microscopy instruments		Bioanalytical instruments		Other instruments	
	Median cost	Percent of respondents	Median cost	Percent of respondents	Median cost	Percent of respondents	Median cost	Percent of respondents	Median cost	Percent of respondents	Median cost	Percent of respondents
Total	\$100,000	100%	\$75,000	28%	\$200,000	21%	\$150,000	11%	\$50,000	20%	\$100,000	20%
Engineering	120,000	100	75,000	35	166,500	23	500,000	7	S	2	140,000	32
Chemistry	300,000	100	S	14	400,000	79	S	6	S	0	S	1
Physics/astronomy	120,000	100	80,000	25	S	4	S	4	S	9	200,000	59
Environmental sciences	80,000	100	50,000	35	150,000	33	150,000	10	S	3	60,000	19
Computer science	125,000	100	127,500	99	S	0	S	0	S	0	S	1
Academic departments	100,000	100	100,000	100	S	0	S	0	S	0	S	0
Computer facilities	175,000	100	200,000	99	S	0	S	0	S	0	S	1
Agricultural sciences	50,000	100	50,000	17	60,000	25	S	3	32,500	44	S	11
Biological sciences	80,000	100	60,000	14	200,000	14	150,000	19	60,000	41	90,000	12
Other, multidisciplinary	100,000	100	S	9	S	26	S	14	S	40	S	11

NOTE: Data are for the 90 percent of respondents who reported a need for instruments costing \$20,000 or more. The remaining 10 percent of respondents reported that their units did not need any additional instrumentation in that price range.

Because of rounding, details may not add to totals.

KEY: S = fewer than 10 cases for analysis

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-11. Total cost and percent of total cost to purchase the top priority item requested, by major type of instrument and field of science and engineering: 1994

[Dollars in thousands]

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Field of science and engineering	All instruments		Computers and data handling instruments		Chromatographs and spectrometers		Microscopy instruments		Bioanalytical instruments		Other instruments	
	Total cost	Percent of total	Total cost	Percent of total	Total cost	Percent of total	Total cost	Percent of total	Total cost	Percent of total	Total cost	Percent of total
Total	\$941,894	100%	\$201,867	100%	\$212,566	100%	\$76,437	100%	\$75,968	100%	\$375,057	100%
Engineering	254,750	27	47,924	24	53,099	25	23,863	31	11,161	15	118,703	32
Chemistry	62,172	7	4,455	2	56,831	27	589	1	0	0	296	*
Physics/astronomy	226,842	24	9,587	5	6,305	3	1,757	2	19,208	25	189,985	51
Environmental sciences	104,163	11	22,553	11	23,271	11	9,725	13	632	1	47,982	13
Computer science	98,745	10	98,614	49	0	0	0	0	0	0	132	*
Academic departments	21,419	2	21,419	11	0	0	0	0	0	0	0	0
Computer facilities	77,326	8	77,194	38	0	0	0	0	0	0	132	*
Agricultural sciences	14,807	2	2,811	1	4,226	2	520	1	3,960	5	3,289	1
Biological sciences	162,801	17	15,165	8	62,404	29	36,270	47	35,850	47	13,112	3
Other, multidisciplinary	17,613	2	757	*	6,430	3	3,713	5	5,156	7	1,558	*

NOTE: Data are for the 90 percent of respondents who reported a need for instruments costing \$20,000 or more. The remaining 10 percent of respondents reported that their units did not need any additional instrumentation in that price range.

Because of rounding, details may not add to totals.

KEY: * = less than 0.5 percent

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-12. Total cost and percent of total cost to purchase the top three priority items requested, by major type of instrument and field of science and engineering: 1994

[Dollars in thousands]

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Field of science and engineering	All instruments		Computers and data handling instruments		Chromatographs and spectrometers		Microscopy instruments		Bioanalytical instruments		Other instruments	
	Total cost	Percent of total	Total cost	Percent of total	Total cost	Percent of total	Total cost	Percent of total	Total cost	Percent of total	Total cost	Percent of total
Total	\$2,047,800	100%	\$324,591	100%	\$478,276	100%	\$148,705	100%	\$168,748	100%	\$927,480	100%
Engineering	534,306	26	75,461	23	106,852	22	38,167	26	20,635	12	293,191	32
Chemistry	145,675	7	6,670	2	129,489	27	818	1	1,398	1	7,300	1
Physics/astronomy	558,151	27	26,337	8	21,194	4	4,226	3	20,973	12	485,421	52
Environmental sciences	199,512	10	33,820	10	57,141	12	36,754	25	6,133	4	65,663	7
Computer science	146,241	7	141,394	44	0	0	0	0	0	0	4,847	1
Academic departments	42,454	2	40,657	13	0	0	0	0	0	0	1,797	*
Computer facilities	103,787	5	100,737	31	0	0	0	0	0	0	3,050	*
Agricultural sciences	48,548	2	4,067	1	12,095	3	2,120	1	8,415	5	21,850	2
Biological sciences	363,263	18	33,616	10	136,770	29	59,318	40	96,461	57	37,099	4
Other, multidisciplinary	52,104	3	3,227	1	14,734	3	7,301	5	14,732	9	12,109	1

NOTE: Data are for the 90 percent of respondents who reported a need for instruments costing \$20,000 or more. The remaining 10 percent of respondents reported that their units did not need any additional instrumentation in that price range.

Because of rounding, details may not add to totals.

KEY: * = less than 0.5 percent

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

Table A-13. Total cost to purchase the top three priority items requested, by type of instrument and field of science and engineering: 1994

[Dollars in thousands]

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Type of instrument requested	Total	Engineering	Chemistry	Physics/astronomy	Environmental sciences	Computer science	Agricultural sciences	Biological sciences	Other, multi-disciplinary
Total, all instruments	\$2,047,800	\$534,306	\$145,675	\$558,151	\$199,512	\$146,241	\$48,548	\$363,263	\$52,104
Computers and data handling instruments	324,591	75,461	6,670	26,337	33,820	141,394	4,067	33,616	3,227
Graphics/CAD/imaging computer systems ..	90,859	23,634	4,908	2,904	8,923	30,319	1,607	16,533	2,031
Other computers/components > \$50K	206,882	43,116	1,524	21,631	21,566	104,507	1,617	12,123	797
Other computers/components < \$50K	26,850	8,711	238	1,801	3,331	6,568	843	4,959	399
Chromatographs and spectrometers	478,276	106,852	129,489	21,194	57,141	0	12,095	136,770	14,734
Electron/auger/ion scattering	18,337	6,335	2,575	5,317	3,554	0	427	0	128
Electron spectroscopy/photo-induced emission elemental analyzer	11,761	2,663	1,581	2,267	3,291	0	1,335	623	0
NMR/EPR spectrometer	230,156	48,666	84,386	5,383	7,391	0	625	81,782	1,924
UV/visible/infrared spectrophotometer	11,724	2,556	2,520	796	943	0	822	4,086	0
Xray diffraction systems	52,014	4,710	16,625	4,095	4,820	0	181	20,829	754
Chromatographs and elemental analyzers ..	48,779	14,854	2,132	0	11,336	0	5,201	14,300	956
Other spectroscopy instruments	105,506	27,068	19,669	3,335	25,807	0	3,506	15,150	10,971
Microscopy instruments	148,705	38,167	818	4,226	36,754	0	2,120	59,318	7,301
Electron microscopes	84,485	31,587	0	3,499	26,932	0	640	21,375	453
Other microscopy instruments	64,220	6,580	818	727	9,822	0	1,480	37,943	6,849
Bioanalytical instruments	168,748	20,635	1,398	20,973	6,133	0	8,415	96,461	14,732
Cell sorters/counters, cytometers	20,885	0	0	0	3,575	0	0	16,283	1,027
Centrifuges and accessories	25,563	1,214	1,122	0	622	0	3,584	18,443	579
DNA/protein synthesizers/sequencers/analyzers	50,139	303	198	0	123	0	1,208	35,302	13,005
Growth/environmental chambers	34,100	18,010	0	234	1,315	0	1,883	12,658	0
Scintillation/gamma radiation/counters/detectors	38,061	1,109	79	20,739	498	0	1,740	13,775	121
Other instruments	927,480	293,191	7,300	485,421	65,663	4,847	21,850	37,099	12,109
Electronics instruments (cameras, etc)	41,974	25,010	0	12,146	613	0	417	3,490	298
Temperature/pressure control/measurement instruments	21,908	11,318	198	6,289	1,164	0	2,344	370	226
Lasers and optical instruments	54,131	28,401	2,957	14,606	613	0	0	6,567	988
Robots, manufacturing machines	26,657	20,798	0	2,180	148	261	629	1,400	1,241
Major instruments (telescopes, ships, nuclear reactors, wind tunnels, etc)	565,725	96,829	1,976	405,058	49,888	2,727	1,746	0	7,501
Other, not elsewhere classified	217,084	110,835	2,169	45,142	13,237	1,859	16,715	25,272	1,855

NOTE: Data are for the 90 percent of respondents who reported a need for instruments costing \$20,000 or more. The remaining 10 percent of respondents reported that their units did not need any additional instrumentation in that price range.

Because of rounding, details may not add to totals.

SOURCE: National Science Foundation/SRS, Survey of Academic Research Instruments and Instrumentation Needs: 1993

APPENDIX B

LIST OF SAMPLED INSTITUTIONS

SAMPLED INSTITUTIONS

Nonmedical Colleges and Universities

Brown University
California Institute of Technology
Colorado State University
Cornell University
Duke University
Georgia Institute of Technology
Harvard University
Johns Hopkins University
Louisiana State University
Massachusetts Institute of Technology
Michigan State University
Mississippi State University
New Mexico Institute of Mining and
Technology
North Carolina State University
Northeastern University
Northwestern University
Ohio State University
Oklahoma State University
Oregon State University
Pennsylvania State University
Princeton University
Purdue University
Rockefeller University
Stanford University
Stevens Institute of Technology
Temple University
Texas A&M University
Texas Tech University
University of Arizona
University of California at Berkeley
University of California at Davis
University of California at Los Angeles
University of California at San Diego
University of Central Florida
University of Colorado at
Boulder and Denver
University of Connecticut
University of Dayton
University of Denver
University of Illinois at Urbana/Champaign
University of Iowa
University of Kansas
University of Maryland at College Park
University of Michigan
University of Minnesota
University of Nebraska at Lincoln

University of North Dakota
University of Oklahoma
University of Pennsylvania
University of South Alabama
University of Texas at Austin
University of Washington
University of Wisconsin at Madison
Virginia Polytechnic Institute
Washington State University
Yale University

Medical Schools

Albert Einstein College of Medicine
Boston University Medical Campus
Duke University Medical Center
Johns Hopkins University School of
Medicine
Mayo Medical School
Medical College of Ohio at Toledo
Northwestern University Medical School
Ohio State University College of Medicine
Temple University School of Medicine
University of California at Los Angeles
School of Medicine
University of California at San Diego
School of Medicine
University of California at San Francisco
School of Medicine
University of Chicago Pritzker School of
Medicine
University of Cincinnati College of Medicine
University of Colorado School of Medicine
University of Kansas Medical Center
University of Minnesota School of Medicine
University of Nebraska Medical Center
University of North Carolina School
of Medicine
University of Pennsylvania
School of Medicine
University of Texas Health
Sciences Center at San Antonio
University of Texas Southwestern
Medical Center at Dallas
University of Washington
School of Medicine
Yale University School of Medicine

APPENDIX C

FIELDS AND SUBFIELDS USED IN THE NATIONAL SURVEY OF RESEARCH INSTRUMENTS AND INSTRUMENTATION NEEDS 1993

FIELDS AND SUB-FIELDS USED IN THE NATIONAL SURVEY OF RESEARCH INSTRUMENTS AND INSTRUMENTATION NEEDS 1993

ENGINEERING

- 101 AEROSPACE ENGINEERING
- 102 AGRICULTURAL ENGINEERING
- 103 BIOMEDICAL ENGINEERING
- 104 CHEMICAL ENGINEERING
- 105 CIVIL ENGINEERING
- 106 ELECTRICAL ENGINEERING
- 107 ENGINEERING SCIENCE
- 108 INDUSTRIAL
ENGINEERING/MANAGEMENT
SCIENCE
- 109 MECHANICAL ENGINEERING
- 110 METALLURGICAL AND MATERIALS
ENGINEERING
- 111 MINING ENGINEERING
- 112 NUCLEAR ENGINEERING
- 113 PETROLEUM ENGINEERING
- 114 ENGINEERING, NOT ELSEWHERE
CLASSIFIED (N.E.C.)

PHYSICAL SCIENCES

- 201 ASTRONOMY
- 202 CHEMISTRY
- 203 PHYSICS
- 204 PHYSICAL SCIENCES, N.E.C.

ENVIRONMENTAL SCIENCES

- 301 ATMOSPHERIC SCIENCES
- 302 GEOSCIENCES
- 303 OCEANOGRAPHY
- 304 ENVIRONMENTAL SCIENCES, N.E.C.

COMPUTER SCIENCE

- 401 COMPUTER SCIENCE
- 499 GENERAL PURPOSE COMPUTER
FACILITY

AGRICULTURAL SCIENCES (SEE ALSO 102)

- 501 AGRICULTURAL SCIENCES

BIOLOGICAL SCIENCES

- 601 ANATOMY
- 602 BIOCHEMISTRY
- 603 BIOLOGY
- 604 BIOMETRY AND EPIDEMIOLOGY
- 605 BIOPHYSICS
- 606 BOTANY
- 607 CELL BIOLOGY
- 608 ECOLOGY
- 609 ENTOMOLOGY AND PARASITOLOGY
- 610 GENETICS
- 611 MICROBIOLOGY, IMMUNOLOGY,
AND VIROLOGY
- 612 NUTRITION
- 613 PATHOLOGY
- 614 PHARMACOLOGY
- 615 PHYSIOLOGY
- 616 ZOOLOGY
- 617 BIOSCIENCES, N.E.C.
- 699 INTERDISCIPLINARY BIOMEDICAL
RESEARCH FACILITY
- 703 CANCER FACILITY

OTHER FIELDS

- 999 OTHER MULTIDISCIPLINARY FIELD

APPENDIX D

DEPARTMENT/FACILITY QUESTIONNAIRE

National Science Foundation and National Institutes of Health
National Survey of Academic Research Instruments and Instrumentation Needs

FY 1993 DEPARTMENT/FACILITY QUESTIONNAIRE

BACKGROUND AND PURPOSE

This Congressionally-mandated survey is vital to provide the National Science Foundation (NSF), the National Institutes of Health (NIH), and other Federal agencies with data to help set appropriate program priorities and equipment funding levels. In addition, special Federal research equipment programs—such as the NSF Academic Research Infrastructure Program, and the NIH Small Instrumentation Grant Program—were established to help meet the academic instrumentation needs that were identified by this survey in the past.

Institution _____

Department/Facility _____

This study is authorized by law (P.L. 96-44). Although you are not required to respond, your cooperation is needed to make the results comprehensive, accurate, and timely. Information gathered in this survey will be primarily used for developing statistical summaries. Information from individual institutions may be made available to policymakers and qualified researchers, with the permission of the Presidents of these institutions.

INSTRUCTIONS

- (1) Items 1-6 (Part A) are factual in nature. Informed estimates are acceptable whenever precise information is not available from existing sources. This section may be delegated to any person or persons who can provide the requested data.
- (2) Items 7-13 (Part B) call for judgments about equipment-related research needs and priorities of the department (or facility) as a whole. **These questions should be answered by the department chairperson or facility director**, or by a designee who is knowledgeable about equipment needs.
- (3) Please report data for your institution's 1993 Fiscal Year.
- (4) PLEASE RETURN THIS FORM TO YOUR INSTITUTION'S SURVEY COORDINATOR. Do not mail the form to NSF, NIH, or Quantum Research Corporation (QRC).

For assistance with this questionnaire that cannot be provided by your survey coordinator please contact Atessa Shahmirzadi or Luz Tatum of QRC at (800) 369-0896.

It is estimated that the response to this survey will require an average of one hour. If you wish to comment on this burden, please contact Herman Fleming, Reports Clearance Officer, NSF, at (703) 306-1243, and the Office of Management and Budget, Paperwork Reduction Project (OMB 3145-0067), Washington, D.C. 20503.

Part A. Descriptive Information and Instrumentation-Related Expenditures

NOTE: Informed estimates are acceptable whenever precise information is not available from existing sources. This section may be delegated to any person or persons who can provide the requested data.

1. This is (Circle One):

An academic department¹ 1

A non-departmental or interdepartmental
research facility, center, or institute¹ 2

NOTE: For purposes of this questionnaire, the word "unit" in the following questions refers to your particular department, non-departmental or interdepartmental research facility, center, or institute.

**CHECK BOX if
response is an ESTIMATE**

2. Number (headcount) of FULL-TIME faculty members²
in your unit: _____

☐

3. Number (headcount) of FULL-TIME faculty members²
in your unit who are participating in separately
budgeted research projects: _____

☐

4. Does your unit have any scientific research
equipment or equipment system³ (whether purchased
or otherwise acquired) with an ORIGINAL COST
of \$20,000 or more? (Circle One)

Yes 1 (CONTINUE with item 5a)

No 2 (SKIP to item 14)

¹ "Academic department" is a degree-granting unit, whereas a non-departmental unit is a non-degree granting unit.

² "Faculty member" includes tenured, non-tenured, teaching, and visiting faculty and researchers of faculty-equivalent rank; it does NOT include postdoctorates.

³ "Scientific Research Equipment" is any item (or interrelated collection of items comprising a system) of nonexpendable tangible property or software, having a useful life of more than two years and a cost of \$500 or more, which is wholly or in part used for research. It includes all scientific research equipment acquired from all sources—Federal, State, the institution's own funds, industry, etc. It also includes donated equipment and any on permanent loan.

5a. ESTIMATED total expenditures in this unit for purchase/acquisition of scientific research equipment¹ or equipment systems DURING THE INSTITUTION'S 1993 FISCAL YEAR:

\$ _____

5b. ESTIMATED proportion of total expenditures for equipment in FY 1993 from each of the following sources:

Funding Source	Percent (Estimate)
Federal	
1. National Science Foundation	_____
2. National Institutes of Health	_____
3. Department of Defense	_____
4. Department of Energy	_____
5. Other Federal sources ²	_____
Non-Federal	
6. Institution or unit funds	_____
7. State grant or appropriation	_____
8. Industry	_____
9. Other non-Federal sources (including private, nonprofit foundations, gifts/donations, bonds)	_____
TOTAL	100%

6. FY 1993 expenditures for maintenance/repair and operation of scientific research equipment in this unit: **(Do not include fringe benefits or overhead costs.)**

**CHECK BOX if
response is an ESTIMATE**

Maintenance/Repair Costs: ³	\$ _____	<input type="checkbox"/>
Operating Costs: ⁴	\$ _____	<input type="checkbox"/>
TOTAL	\$ _____	<input type="checkbox"/>

¹ "Scientific Research Equipment" is any item (or interrelated collection of items comprising a system) of nonexpendable tangible property or software, having a useful life of more than two years and a cost of \$500 or more, which is wholly or in part used for research. Include all scientific research equipment acquired from all sources—Federal, State, the institution's own funds, industry, etc. Also include any expenditures connected with equipment that is donated or on permanent loan.

² Federal sources include: Departments of Agriculture, Commerce, Education, Health and Human Services other than NIH, Housing and Urban Development, Interior, Justice, Labor, and Veterans Affairs; and the following agencies: Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the National Aeronautics and Space Administration (NASA).

³ Maintenance/Repair Costs include maintenance agreements, service contract costs, salaries of department- or institution-provided maintenance/repair personnel, and costs of supplies, equipment, and facilities for servicing research instruments in this unit.

⁴ Operating Costs include salaries for technicians or other personnel paid to operate research equipment, and costs of supplies and materials used in operating the equipment.

Part B. Adequacy of and Need for Research Equipment

NOTE: We suggest that these questions be answered by the department chairperson, or facility director, or by a designee who is knowledgeable about equipment needs. Circle the number on the rating scale that best describes the adequacy and need of your department's research equipment. We realize that some instruments in your unit are more adequate to meet your needs than others; nevertheless, please CIRCLE on the rating scales your general impression of the equipment as a WHOLE.

- 7a. The overall capability of the research equipment in my unit to enable existing faculty investigators to pursue their major research interests is:

Excellent		Adequate		Poor
1	2	3	4	5

- 7b. If your response in Question 7a above was 4 or 5, what would be the estimated cost to acquire sufficient research equipment that would fully support your existing faculty?

\$ _____ (estimated)

8. Over the past two years, the needs for research equipment in my unit have:

Substantially Increased		Remained About the Same		Substantially Decreased
1	2	3	4	5

9. The maintenance/repair of the research equipment in my unit is:

Excellent		Adequate		Poor
1	2	3	4	5

10. The availability of resources to operate current equipment in my unit is:

Excellent		Adequate		Poor
1	2	3	4	5

11. Please indicate below the three pieces of equipment, costing \$20,000 or more (including the cost of accessories), that are most needed to bring your unit's research equipment up to your faculty's full capabilities.

Using the taxonomy listed below, please choose the code number of the equipment category that most nearly describes the desired equipment, and write those numbers in the three spaces below. In addition to identifying the equipment, please estimate its costs and indicate whether its primary purpose is to (1) replace an existing item; (2) expand capacity—i.e., more copies of existing equipment; or (3) upgrade capabilities—i.e., perform experiments that you cannot do now. **Please list in priority order beginning with priority No. 1.**

☐ **This unit does not need any additional pieces of equipment in this price range. (SKIP to Question 12).**

Item Code Number (From the list below)	Approximate Cost per Item	Reason Needed
1. _____	\$ _____	Replace existing instrument 1 Expand capacity 2 Upgrade capabilities 3
2. _____	\$ _____	Replace existing instrument 1 Expand capacity 2 Upgrade capabilities 3
3. _____	\$ _____	Replace existing instrument 1 Expand capacity 2 Upgrade capabilities 3

CODE

COMPUTERS AND DATA HANDLING

- 01 Graphics/Computer Assisted Design/Imaging Computer Systems
- 02 Other Computer Systems—With purchase price of \$50,000 and more
- 03 Other Computer Systems/Components—With purchase price of less than \$50,000

CHROMATOGRAPHS AND SPECTROMETERS

- 04 Electron/Auger/Ion Scattering
- 05 Gas/Liquid Chromatograph
- 06 Electron Spectroscopy/Photo Induced Emission Elemental Analyzer
- 07 NMR/EPR Spectrometer
- 08 Ultraviolet/Visible/Infrared Spectrophotometer
- 09 X-Ray Diffraction Systems
- 10 Chromatographs and Elemental Analyzers
- 11 Other Spectroscopy Equipment

MICROSCOPY EQUIPMENT

- 12 Electron Microscopes
- 13 Other Microscopy Equipment

MISCELLANEOUS

- 14 Cell Sorters/Counters, Cytometers
- 15 Centrifuges and Accessories
- 16 DNA/Protein Synthesizers/Sequencers/Analyzers
- 17 Growth/Environmental Chambers
- 18 Scintillation/Gamma Radiation/Counters/Detectors
- 19 Electronics Equipment (Cameras, etc.)
- 20 Temperature/Pressure Control/Measurement Equipment
- 21 Lasers and Optical Equipment
- 22 Robots, Manufacturing Machines
- 23 Major Prototype Equipment (Telescopes/Astronomical Instrument Systems, Ships, Planes, Nuclear Reactors, Wind Tunnels, MBE Systems, Other Major Systems)
- 24 Other, not elsewhere classified

- | | | |
|--------------|----------------------|---|
| (Circle One) | Under \$10,000 | 1 |
| | \$10,000-19,999 | 2 |
| | \$20,000-49,999 | 3 |
| | \$50,000-99,999 | 4 |
| | \$100,000-499,999 | 5 |
| | \$500,000-999,999 | 6 |
| | \$1,000,000 and over | 7 |

- Yes 1
No 2

- Time required to complete this form: _____
Hours Minutes

Telephone No. () _____ FAX () _____